Influence of multiple processing cycles on the mechanical properties of a PP-PET compatibilized blend

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Circular economy is what each manufacturer thrives these days, how can we recycle or reuse plastics as optimal as possible. What happens next? As commingled plastics are often recycled with the help of a compatibilizer, impact modifier or flow improver, what will happen if these recycled waste streams would be reprocessed again? A literature review stated that thermogravimetric analysed compatibilized blends proved that the use of a compatibilizer improves the thermal stability of the blend. This research starts from an optimized poly(propylene) (PP) (75 wt%) and poly(ethylene terephthalate) (PET) (25 wt%) blend with 5 wt% block copolymer poly(styrene-*co*-(ethylene-butylene)-styrene) grafted with 1,5 wt% maleic anhydride (SEBS-g-MA). The mix is reprocessed five times with a single screw extruder at 265°C in order to get an insight on the overall degradation of the mixture on the mechanical properties. This is done by means of SEM images and DSC results. The mechanical properties such as elongation at break and the Young's modulus shows a rather small deviation. While the elongation at yield improves slightly until the second reprocessing step and stabilizes. These results are not influenced by crystallinity since the crystallinity of PP and PET (from the first heating run) remains the same during the multiple processing steps. There is however a change in morphology. From the SEM images prior to tensile testing the dispersed phase remains well dispersed for each reprocessing step. However, it also coincide with a small increase in size distribution. As can be noticed by a shift in shape of the dispersed phase from spheres towards a mix of spheres and small ellipsoids in the centre of the tensile bars. These changes are minor and cannot reflect their influence on the Young's moduli due to the presence of the thermoplastic elastomer.